SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: CALCULUS

CODE NO.: MTH551-4 **SEMESTER:** III

PROGRAMS MECHANICAL/ELECTRICAL/ELECTRONICS/COMPUTER TECHNOLOGY

AUTHOR: JOHN REAL

^P^TE: FEBRUARY 1994 **PREVIOUS OUTLINE DATED:** JULY 1993

APPROVED: _____ *fehzff^f*
                  DEAN V   **DATE**

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TOTAL CREDIT HOURS: 64

PREREQUISITE(S): MTH4 2 6

I.   PHILOSOPHY/GOALS:

The basic concepts of calculus are introduced through an emphasis on
applications and examples. Topics include limits, simple derivatives,
derivatives of trigonometric and logarithmic functions, applications of
derivatives, curve sketching, integration, and applications of
integration.

II.   STUDENT PERFORMANCE OBJECTIVES:

The basic objectives are that the student develop an understanding of
the methods studied, demonstrate a knowledge of the facts presented and
show an ability to use these in the solution of problems. To
accomplish these objectives, exercises are assigned. Test questions
will be of near equal difficulty to questions assigned in the
exercises. The level of competency demanded is the level required to
pbtain an overall passing average on the tests. The material to be
'covered is listed below.

III.   TOPICS TO BE COVERED: **TIME FRAME**

1. The Derivative,   15 periods

    Applications of the Derivative.   15 periods

     Integration.   10 periods

    Applications of Integration.   10 periods

    Differentiation of
    Transcendental Functions   14 periods

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IV. TERMINAL PERFORMANCE OBJECTIVES - MTH551

Topic 1:
1. Evaluate limits of algebraic functions.
2. Approximate the slope of a tangent to a curve.
3. Find the derivative of an algebraic function using the delta method.
4. Find instantaneous rates of change of a function using derivatives.
5. Find the derivative of a polynomial using a rule.
6. Find derivatives of other algebraic functions (products and quotients) using rules for differentiation.
7. Find the derivative of a power of a function - Chain rule,
8. Find the derivative of an implicit function.
9. Find higher derivatives of algebraic functions.

Topic 2:
1. Find slopes and equations of tangent and normal lines.
2. Compute velocities and accelerations for curvilinear motion.
3. Solve related rate problems .
4. Make graphs of non-linear functions using derivatives.
5. Make graphs of discontinuous functions using derivatives, asymptotes, intercepts.
6 . Solve applied maximum-minimum problems .

Topic 3:
1. Use differentials to compute small changes in a function.
2. Find an antiderivative using derivative rules.
3. Use the basic rule for integration of algebraic functions.
4. Determine approximate areas under curves from graphs,
5. Determine exact areas under curves by integration - the fundamental theorem of integral calculus.
6. Evaluate other algebraic definite integrals.

Topic 4:
1. Solve problems involving distance-velocity-acceleration, current-voltage-charge using integration.
2. Find areas (between two curves) using horizontal and vertical elements and definite integrals.
3. Find the volume of a solid of revolution using the disk or shell method.

Topic 5:
1. Find derivatives of expressions containing sine or cosine functions.
2. Find derivatives of other trigonometric functions.
3. Find derivatives of inverse trigonometric functions.
4. Solve worded problems which involve trigonometric functions.
5. Find derivatives of logarithmic functions - any constant base
6. Find derivatives of exponential functions - any constant base
7. Solve worded problems involving logarithmic of exponential functions.

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V.   LEARNING ACTIVITIES   REQUIRED RESOURCES

1.0	The Derivative	Chapter 22
1.1	Limits.	Questions 1 - 44, p. 649
1.2	The slope of a tangent to a curve.	Questions 1 - 24, p. 655
1.3	The derivative.	Questions 1 - 32, p. 660
1.4	The meaning of the derivative.	Questions 1-32, p. 664
1.5	Derivatives of polynomials.	Questions 1 - 44, p. 669
1.6	Derivatives of products and quotients of functions.	Questions 1 - 44, p. 674
1.7	The derivative of a power of a function.	Questions 1-44, p. 680
1.8	Differentiation of implicit functions.	Questions 1 - 32, p. 684
1.9	Higher derivatives.	Questions 1-36, p. 688
1.10	Review exercise	Questions 1-68, p. 689
2.0	Applications of the Derivative	Chapter 23
2.1	Tangents and normals.	Questions 1 24, p. 696
2.2	Curvilinear motion.	Questions 1 24, p. 705
2.3	Related rates.	Questions 1 24, p. 709
2.4	Using derivatives in curve sketching.	Questions 1 32, p. 716
2-5	More on curves.	Questions 1 - 18, p. 720
2.6	Applied maximum and minimum problems.	Questions 1 - 32, p. 727
2.7	Review exercise.	Questions 1 48, p. 728
3.0	Integration	Chapter 24
13.1	Differentials	Questions 1 32, p. 735
3.2	Antiderivatives	Questions 1 32, p. 738

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V,   LEARNING ACTIVITIES:(contd) REQUIRED RESOURCES

      Integration (contd)

3.3	The indefinite integral	Questions 1 - 44, p. 744
3.4	The area under a curve	Questions 1 - 16, p. 750
3.5	The definite integral	Questions 1 - 36, p. 753
3.6	Review exercise	Questions 1 - 36, p. 761
		45 - 32
4.0	Application of Integration	Chapter 25
4.1	Applications of the indefinite integral	Questions 1-20, 23, p. 769
4.2	Areas by integration	Questions 1-27, p. 775
4.3	Volumes by integration	Questions 1-26, p. 782
.4.4	Review Exercise	Questions 1-22, p. 802
5.0	Differentiation of Transcendental Functions	Chapter 26
5.1	Derivatives of sine and cosine functions	Questions 1-50, p. 809
5.2	Derivatives of other trigonometric functions	Questions 1-46, p. 813
5.3	Derivatives of inverse trigonometric functions	Questions 1-41, p. 817
5.4	Applications	Questions 1-8, 11-16, p. 821
5.5	Derivatives of logarithmic functions	Questions 1-48, p. 826
5.6	Derivatives of exponential functions	Questions 1-48, p. 829
5.7	Applications	Questions 1-32, p. 833
5.8	Review	Questions 1-50, p. 835

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VI. METHOD OF EVALUATION:

1. Three - four tests per semester.

2. Final grade is a weighted average of these tests

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\begin{array}{rcl}
90 - 100 &=& \text{A-i-} \\
80 - 89 &-& \text{A} \\
65 - 79 &=& \text{B} \\
55 - 64 &=& \text{C} \\
0 - 54 &=& \text{R (or}
\end{array}
$$

Under special circumstances an X grade may be assigned to allow the student to continue with the next math, course. If unsuccessful with this next course, both courses would have to be repeated.

All tests are scheduled in advance. Hence, attendance is mandatory. Unexcused absence from a test will result is a mark of zero for that test. If a student is prevented from writing a test by illness, the instructor should be notified before the time of the test. Upon return to class, the student should see the instructor immediately to arrange a time for a make-up test. The student should have a note from the
» ollege nurse or a doctor.

VII. REQUIRED STUDENT RESOURCES:

1. Text: Washington, <u>Basic Technical Mathematics With Calculus</u>, fifth edition, metric version. Benjamin/Cummings Pub. Co. 1990

2. Calculator: Recommended; Sharp Scientific calculator EL-531G Note: Most scientific calculators are acceptable. However, programmable calculators and graphical display calculators may be prohibited during tests.

VII. SPECIAL NOTES:

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accoimnodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.